CLAIMS

WE CLAIM:

1. A method for acquiring image data with a computer tomography imaging system, the steps comprising:

a) producing a cone beam of x-rays with an x-ray source and directing it into a region of interest in accordance with a prescribed scan pattern; and

b) detecting x-rays in the cone beam after they have passed through the region of interest;

wherein the x-ray source is mechanically moved around the region of interest when performing the prescribed scan pattern and a focal point of the cone beam of x-rays is electronically moved to positions along an axial dimension of the region of interest when performing the prescribed scan pattern.

2. The method as recited in claim 1 in which steps a) and b) are repeated to acquire an additional set of image data with a second scan pattern that is interleaved with the prescribed scan pattern.

3. The method as recited in claim 1 in which the x-ray source is comprised of an electron gun and an anode and the cone beam of x-rays is produced by directing the electron beam at a focal point on the anode, and wherein the electronic movement of the focal point of the cone beam of x-rays is performed by electronically moving the electron beam.

4. The method as recited in claim 1 in which the prescribed scan pattern includes moving the x-ray source around the region of interest and periodically electronically moving the x-ray source along the axial dimension in response to a cardiac trigger signal.

5. The method as recited in claim 4 in which the x-ray source is moved once around the region of interest during the performance of the prescribed scan pattern and the x-ray source is electronically moved a plurality of times along the full extent of the axial dimension a plurality of times in response to each cardiac trigger signal.

6. The method as recited in claim 1 in which the x-ray source is comprised of a set of separate x-ray sources disposed along the axial dimension of the region of interest and the electronic movement of the focal point of the cone beam of x-rays is performed by switching the separate x-ray sources on and off during the prescribed scan pattern.

7. A computer tomography imaging system which comprises:

a table for supporting a subject in a cylindrical region of interest disposed along an axis;

an x-ray source for producing a cone beam of x-rays directed into the cylindrical region of interest;

a two-dimensional array of detectors disposed around a portion of the cylindrical region of interest and oriented to detect x-rays in the cone beam after they pass through the region of interest;

a gantry for supporting the x-ray source and two-dimensional array of detectors and for rotating them around the cylindrical region of interest in a plane perpendicular to the axis;

means for electronically moving a focal point of the cone beam of x-rays to positions along the direction of the axis;

means for directing the rotation of the gantry and the electronic axial movement of the cone beam focal point in accordance with a prescribed scan pattern; and

means for acquiring signals produced by detected x-rays during performance of the prescribed scan pattern and reconstructing an image therefrom.

8. The computer tomography imaging system as recited in claim 7 in which the two-dimensional array of detectors extends substantially the entire axial length of the cylindrical region of interest.

9. The computer tomography imaging system as recited in claim 7 in which the x-ray source includes an electron gun that produces an electron beam that strikes an anode to produce the cone beam of x-rays and the means for electronically moving the cone beam focal point along the axial direction moves the electron beam.

10. The computer tomography imaging system as recited in claim 7 which further includes a collimator disposed between the two-dimensional array of detectors and the cylindrical region of interest which is operable to reduce radiation from sources other than the x-ray source reaching the two-dimensional array of detectors.

11. The computer tomography imaging system as recited in claim 10 which includes a second collimator disposed between the x-ray source and the cylindrical region of interest which is operable to limit the axial extent of the cone beam of x-rays reaching the region of interest.

12. The computer tomography imaging system as recited in claim 7 in which the x-ray source includes a set of separate x-ray sources disposed along the direction of said axis and the means for electronically moving the focal point includes a switch connected to turn the separate x-ray source on and off.

13. The computer tomography imaging system as recited in claim 7 which includes a collimator disposed between the x-ray source and the cylindrical region of interest to shape the cone beam of x-rays.

14. The computer tomography imaging system as recited in claim 13 in which the cone beam of x-rays is shaped to intersect substantially all the detectors in said two-dimensional array of detectors when produced from any of said focal point positions along the direction of the axis.

15. The computer tomography imaging system as recited in claim 13 in which the cone beam of x-rays is shaped to intersect a segment of the detectors in said two-dimensional array of detectors and said segment includes substantially less than all the detectors in said array of detectors.

16. A method for producing an image with a computer tomography imaging system, the steps comprising:

a) producing a cone beam of x-rays with an x-ray source and directing it into a region of interest;

b) detecting x-rays in the cone beam after they have passed through the region of interest;

c) controlling the scan pattern of the x-ray source by moving it around the region of interest and moving it electronically to positions along an axial dimension of the region of interest to acquire a first attenuation data set with a first spiral scan pattern;

d) repeating step c) to acquire additional attenuation data sets with spiral scan patterns that interleave;

e) transforming the acquired attenuation data sets to a corresponding series of k-space data sets;

f) combining k-space data from temporally adjacent k-space data sets; and

g) reconstructing an image from the combined k-space data.

17. The method as recited in claim 16 in which the combined k-space data is formed by combining all the k-space data from one of said k-space data sets with peripheral k-space data from another, temporally adjacent k-space data set.

18. The method as recited in claim 17 in which a series of images are produced by combining all of the k-space data from respective ones of the k-space data sets with peripheral k-space data from temporally adjacent k-space data.

19. A method for producing an image with a computer tomography imaging system, the steps comprising:

a) producing a cone beam of x-rays with an x-ray source and directing it into a region of interest;

b) detecting x-rays in the cone beam after they have passed through the region of interest;

c) controlling the scan pattern of the x-ray source by moving it around the region of interest and moving it electronically to positions along an axial dimension of the region of interest to acquire a first attenuation data set with a first spiral scan pattern;

d) repeating step c) to acquire additional attenuation data sets with spiral scan patterns that interleave; and

e) reconstructing an image by combining all of the data from one of said attenuation data sets with a part of the data from a temporally adjacent attenuation data set.

20. The method as recited in claim 19 in which a series of images are produced by combining all of the data from respective ones of said attenuation data sets with less than all of the data from temporally adjacent attenuation data sets.

21. The method as recited in claim 19 in which said attenuation data sets are processed before being combined.